The Lady-Slipper

Summer 2015 Issue

a publication of the Kentucky Native Plant Society **www.knps.org**

2nd Kentucky Botanical Symposium: Conservation, Restoration and Landscape in the Bluegrass

October 9 and 10, 2015, University of Kentucky campus

The 2014 KNPS symposium at Bernheim Forest was such a success we are partnering with several groups in the Lexington area to bring the 2015 Kentucky Botanical Symposium to the UK campus. On Friday, October 9th, we have a series of speakers lined up to share their research and habitat restoration efforts. Panel discussions will follow the talks and there will be ample time to network with others as well. Saturday morning will feature field trips and demonstrations at the UK Arboretum. Our tentative agenda is as follows, all times and speakers are subject to change.

Friday, October 9th, ES Good Barn (http://maps.uky.edu/campusmap/)

8:30 AM Welcome
8:45 AM Keynote: Jennifer Ceska, Conservation Coordinator at the State Botanical Garden of Georgia http://botgarden.uga.edu/conserve.php – Building partnerships for native plant conservation.
10:00 AM Rebecca McCulley, UK Plant and Soil Science professor, http://www.mcculleylab.org/ - Native grasslands and fescue research.
10:25 AM Scott Fennel and Larry Brewer, NKU, Northern Kentucky Stream and Wetland Restoration Program, http://environmentalrestoration.nku.edu/ - Rare species surveys and monitoring with stream restoration.
10:50 AM Break
11:05 AM Jim Shaffer, UK Biology doctoral student - Bluegrass savanna woodlands research.
11:30 AM Research presentation TBD
12:00 PM Research Panel Discussion
12:30 PM Lunch
2:00 PM Chris Chandler, TNC Director of Urban Conservation - Conservation in the Metro area.
2:25 PM Don Pelley and Ben Leffew, Shaker Village naturalists - Grassland restoration at Shaker Village.
2:50 PM Kent Slusher, KDF - Forest management in the inner bluegrass.
3:15 PM Break
3:30 PM Joe Lacefield, KDFWR – Private lands native plant management in the inner bluegrass.
4:00 PM Management Panel Discussion

Saturday, October 10th, UK Arboretum (http://maps.uky.edu/campusmap/)

9:00 AM Concurrent field demonstrations in woods, grasslands, and wetlands
10:00 AM Concurrent field demonstrations in woods, grasslands, and wetlands
11:00 AM Concurrent field demonstrations in woods, grasslands, and wetlands
1:00 PM Field trips leaving for native plant restoration sites in Fayette County

A $25 registration fee will cover both days, lunch will not be provided.

A registration contact form is available at www.knps.org, just submit your information and you will be contacted prior to the symposium. Organization and vendor booth space is available on both days.

KNPS President's Message by Zeb Weese

If you are reading this then the KNPS needs your involvement! The good news is your involvement is easy and fun. First of all, make plans to attend the 2015 Kentucky Botanical Symposium in Lexington in October. Our tentative agenda is on page 1 of this newsletter. On Friday we have a bunch of great speakers lined up to brief us on their research and management efforts in the Bluegrass region. Our keynote speaker, Jennifer Ceska of the Georgia Native Plant Alliance will tell us about their efforts to bring Georgia's conservation community together, something we certainly need in Kentucky. On Saturday, we'll be hosting demonstrations and educational booths at the UK Arboretum geared toward educating the general public as well as conservation professionals and offering field trips —bring your family and friends who might just barely be thinking about native plant conservation! Thanks to Floracliff Nature Sanctuary, Wild Ones of Lexington, Friends of Wolf Run, the Bluegrass Woodland Restoration Center, and the UK Arboretum for all their efforts in planning this great event. We are looking for additional sponsors and organizations interested in having informational booths, just leave your contact information at the registration form at www.knps.org.

On a related note, we need some applicants for our research grants which will be awarded at the symposium. If you know any students that could use free money, the information is on page 2. Finally, we are in the midst of this year's ever-popular Native Plant Certification Program. If you would like to get on the waiting list for the 2016 class please contact certification@knps.org.

See you all at they symposium! Zeb

Inside this issue:

The Lady-Slipper is intended to be published by the Kentucky Native Plant Society [IRC 501(c)(3)] in March, June, Sept., and Dec. Deadlines are the 10th of the prior months, but Editorial Committee members welcome article submissions at any time. Send dues and membership status inquiries to:

Kentucky Native Plant Society Membership, 801 Schenkel Lane, Frankfort, KY 40601
www.knps.org info@knps.org

KNPS STUDENT RESEARCH GRANTS

KNPS is pleased to announce the student research grant program, a funding source to support botanical knowledge and understanding in Kentucky. We are pleased to offer awards of $500 for graduate student projects, and $250 for undergraduate projects. Awards will be given for field-based botanical project(s) which contribute to the knowledge of Kentucky's flora or natural communities (with students preferably attending a Kentucky college or university). The grant may be used to purchase consumable supplies and materials such as rebar, herbarium paper, label stock, and topographic maps. The grant may also be used to cover travel expenses. It may not be used to pay time (e.g., labor) for any party. Applications are due by **September 4, 2015**. Applications will be evaluated prior to the October symposium. Funding amount may vary depending on the applicant pool (and may include no grants given). Proposals will be reviewed by the KNPS Grant Committee.

Proposals must include:

1. A current resume/curriculum vitae;

2. A proposal (not to exceed two single-spaced typed pages) identifying the research as either graduate or under-graduate, and describing the proposed research and the role the grant would play in the research;

3. An itemized budget;

4. One letter of recommendation from a faculty member.

Applicants are encouraged to become members of the KNPS, but membership is not required to be awarded a grant. Grant recipients are required to provide KNPS with a short summary of the funded research suitable for publishing in KNPS's newsletter, *The Lady-Slipper,* within one year of receiving the grant. Grant recipients are also expected to present their work at the KNPS Fall or Spring meeting, and we encourage presenting their work at the annual Kentucky Academy of Sciences meeting within one year of completion of their research.

Submit electronic copies (as Word or PDF attachments) of all items listed above including letter of recommendation (sent separately by faculty member) to:

dtaylor02@fs.fed.us

The KNPS's goals:

To serve as the Kentucky native plant education resource;

To support native plant research;

To support efforts to identify and protect endangered, threatened, and rare native plant species;

To promote appreciation of the biodiversity of native plant ecosystems;

To encourage the appropriate use of native plants.

Kentucky Botany Hall of Fame
2015 Inductees

André Michaux,

Constantine Rafinesque

E. Lucy Braun

Mary E. Wharton

Article by Ronald Jones

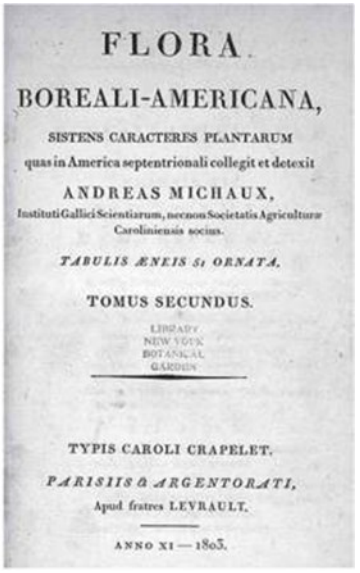
Ronald Jones, Wilson Francis, and David Taylor—KBHOF Selection Committee Members

At a meeting in early 2015, the Kentucky Native Plant Society Board voted to establish a "Kentucky Botany Hall of Fame." The intent of this Hall of Fame would be to recognize those people that had left a "substantial and long-lasting impact" on our knowledge of the flora and vegetation of the Commonwealth. No other particular criteria were thought necessary. The inductees could include, but not be limited to, professional botanists, ecologists, teachers, authors of articles or books on botanical topics, amateur naturalists, conservationists, and others who have helped to discover and document the botanical resources of the state. A committee of three KNPS members was selected, and charged with developing a plan to initiate this project. The committee decided to select four inductees for the initial class, and afterward, add one new inductee per year. In this first year the selection committee nominated and voted on the initial class. In future years the selection committee as well as KNPS members can nominate candidates for the recognition. The Kentucky Botany Hall of Fame will be featured on the KNPS website, and include images and biographical accounts of their contributions to Kentucky botany.

The KBHOF Selection Committee had very little trouble coming with the first four inductees, these representing the 18th, 19th, and 20th centuries, and it is obvious that all of these four individuals had a huge impact on Kentucky botany.

Note: some of this material is taken from Plant Life of Kentucky (Jones 2005).

André Michaux (1746—1802)


FLORA
BOREALI-AMERICANA,
SISTENS CARACTERES PLANTARUM
quas in America septentrionali collegit et detexit
ANDREAS MICHAUX,
Instituti Gallici Scientiarum, necnon Societatis Agriculturæ Caroliniensis socius.
TABULIS ÆNEIS SI ORNATA.
TOMUS SECUNDUS.
LIBRARY NEW YORK BOTANICAL GARDEN
TYPIS CAROLI CRAPELET.
PARISIIS & ARGENTORATI,
Apud fratres LEVRAULT.
ANNO XI — 1803.

André Michaux can be called the father/founder of Kentucky botany. His descriptions of the region were important glimpses into Kentucky's past. He collected prolifically and subsequently described many species found in the state. His work set the stage for several following botanists including his son, Franciois Michaux and Constantine Rafinesque. In addition, with his continental flora, he did much to usher in North American botany.

André Michaux was born in 1746 near Versailles, France. Trained to take over as superintendent of a wealthy landowner's estate, he abandoned this career after the death of his newlywed wife, and turned his attention to botany. He quickly made a name for himself in botanical circles in France and became a plant collector for the royal gardens in Paris.

In 1785 he traveled to North America accompanied by his 15 year-old son, François, who also became a noted botanist. He constructed botanical gardens in New Jersey and in Charleston, South Carolina, and explored eastern North America for 11 years, traveling through Kentucky several times between 1793 and 1796, making numerous collections and eventually describing many new genera and species (nearly 300 plant species in Kentucky were first described by Michaux). His book 1803 *Flora Boreali-Americana*, published posthumously, was the first flora of North America based entirely on the author's own botanical studies. Michaux's collections in Kentucky helped provide the foundation for this great work. His name is commemorated as an epithet for several species, including *Croton michauxii* (now *Croton linearis*), *Hedyotis michauxii* (now *Houstonia serpyllifolia*), *Quercus michauxii* and *Saxifraga michauxii*. He also provided some of the earliest descriptions of the vegetation of the central Kentucky region, noting, for example, the unusual set of species in the Bluegrass region. André Michaux returned to France in 1796 with his many plant collections, which are still preserved in the Michaux Herbarium in Paris. Over the next four years he worked on his book, but it was yet to be published when he set sail for the South Seas on another botanical expedition. He never returned to Paris, succumbing to malaria on Madagascar in 1802 (although there are some reports that he was alive at least until 1810).

There are many websites devoted to André Michaux, and these describe many other interesting aspects of his life, such as being offered a "Lewis and Clark" type expedition by President Jefferson a decade before the Corps of Discovery Expedition, and acting as a spy for the French government, attempting to recruit American frontiersmen (in Kentucky) to join forces with the French to oust the Spanish from Louisiana.

Constantine Samuel Rafinesque (1783—1840)

Constantine Rafinesque has generated more interest in his life and work than any other American naturalist. He explored Kentucky from 1818 until 1825, collecting perhaps 10,000 specimens, and, in his career, published over 900 books and articles, described thousands of new genera and species (mostly plants). He remains a source of fascination, as articles and books that discuss Rafinesque continue to be published to this day. His Kentucky legacy is forever tied to that of Dr. Charles Short, to Transylvania University and the "infamous curse," and to his botanical collecting and publishing on the flora of Kentucky.


Constantine S. Rafinesque. Image courtesy of Transylvania University.

Born in Turkey and raised in France, Rafinesque was a child prodigy and already a learned naturalist when he arrived in America at the age of 20. He later described himself as a botanist, naturalist, geologist, geographer, historian, poet, philosopher, economist, and philanthropist. He botanized for a few years in the middle Atlantic states, then returned to Europe, lived in Sicily for about 10 years, and returned to America in 1815 with a cargo of botanical drugs and 50 boxes of books and collections, all of which he lost in a shipwreck off Block Island, New York.

Discouraged but full of excitement about all the discoveries that awaited him, Rafinesque launched himself into a frenzy of activity over the next few years, traveling back and forth across the Alleghenies. From 1818 to 1826 Rafinesque focused his attentions almost entirely on Kentucky. An encounter with John James Audubon in Henderson Kentucky in 1818 produced several stories that have become legendary (see the accounts concerning Audubon's violin and his drawings of a fake fish). Rafinesque eventually made his way to Lexington and secured a position as a Professor of Botany and Natural History at Transylvania University, a position he held until 1825. He traveled mostly in central and western portions of the state, collecting thousands of specimens in Kentucky. Early on he established a working relationship with Dr. Charles Short, the renowned Kentucky botanist, but this association eventually soured due to their different standards relating to information exchange and specimen preparation. He published *Florula Kentuckiensis* in 1824, the first general account of the plant life of the state.

After a disagreement with Horace Holley, the president of the university, in the Fall of 1825, he departed Kentucky in 1826. He famously left a curse on the university, and, curiously, President Holley soon lost his position, contracted yellow fever and passed away from the disease, and in addition, the university administration building burned down! Eventually Rafinesque settled in Philadelphia, but there he fell upon hard times, and died in 1840.

During his lifetime this prodigious naturalist proposed more new names than any other American naturalist, a phenomenal total of about 2700 new genera and nearly 6900 new species, the majority being vascular plants. His work was generally frowned upon by his contemporaries, for a number of reasons, including his difficult personality, his fanatical desire to describe new species, and his atypical methods of publishing his discoveries. Sadly, most of his lifetime collections (containing an estimated 50,000 specimens and possibly 10,000 Kentucky specimens) have been lost. His herbarium was put on public sale, but without a single bidder it was left abandoned in a storage room, where the collection was heavily damaged by rats. Most specimens became very damaged and were discarded. Although some of his specimens remained at other herbaria, including some type specimens, there seems no doubt that thousands of possible type specimens were lost. It was a tragic loss for botanical science and for Kentucky botany.

Rafinesque's many eccentricities are legend but there is no doubt of his legacy. His published articles and books total over 900 titles. Included among them is the first descriptive outline of the vegetation regions of Kentucky, as well as the first general account of the plant life of Kentucky He also wrote a Medical Flora (1828-1830) that had great influence on the development of medical botany in the United States His many descriptions of new genera and species have been studied over the last few decades, and many of his names have been resurrected. Over 100 genera and species in Kentucky bear the "Raf." author citation. Among the species named in memory of Rafinesque are *Viburnum rafinesquianum* and *Viola rafinesquii*.

E. Lucy Braun (1889—1971)


E. Lucy Braun. Image courtesy of Hunt Institute for Botanical Documentation

E. Lucy Braun was the most active botanical researcher and publisher on the Kentucky flora and vegetation during the 1930s and 1940s. She published the first detailed plant species list for Kentucky, described new plant species for the state, and conducted some of the first large scale vegetation studies in the state.

E. Lucy Braun was a life-long resident of Cincinnati, attending the University of Cincinnati for all her degrees, studying geology at the bachelor's and master's level, and earning a Ph.D. in botany in 1914. She was the second woman to earn a Ph.D from the University of Cincinnati (her sister Annette was the first). The title of her dissertation was "The physiographic ecology of the Cincinnati region." She remained at the university for the remainder of her career, beginning as a geology teaching assistant, and ending as a full professor of plant ecology, retiring in 1948 to devote her time to research. She also holds the distinctions of being the first woman elected to the Ohio Conservation Hall of Fame, and the first woman elected president of the Ecological Society of America. She began collecting plant specimens while in high school, and continued collecting throughout her career, accumulating over 12,000 herbarium specimens, many of these from Kentucky (these were eventually sent to the Smithsonian Institute and are still housed there). She wrote four books and about 180 journal articles, with nearly two dozen of these devoted to Kentucky topics.

Included in her publications were the descriptions of several new species and varieties, including two of Kentucky's most endangered plants—*Arabis perstellata* and *Solidago albopilosa*. In addition, several species and varieties have been named in honor of Dr. Braun, including *Ageratina luciae-brauniae*, and *Silphium terebinthinaceum* var. *luciae-brauniae*. Her most significant publication on Kentucky botany was the *Annotated Catalog of Spermatophytes of Kentucky*, published in 1943, which gave detailed accounts for 1636 species, varieties, forms, and hybrids. Braun's list contained habitat information and county distributions. It remained the only annotated checklist of Kentucky plants for nearly 50 years. During her Kentucky studies, she traveled with her sister Annette, often visiting remote areas of Appalachian Kentucky (where it is said that they often encountered moonshiners but always tried to make friends so that they could explore the mountains). Included in her Kentucky publications were landmark studies of the flora and vegetation of Pine Mountain and Black Mountain.

Although she accomplished much floristic work, Braun's primary focus was plant ecology, and her magnum opus was the monumental *Deciduous Forests of Eastern North America*, published in 1950. In this book Braun described and classified the different forest types of eastern North America. To this day it is required reading for students of plant ecology throughout the region. Her other major books included treatments of the woody plants and monocots of Ohio, published in 1961 and 1967, and these also were of regional significance and have been invaluable to the work of Kentucky botanists.

Mary E. Wharton (1912—1991)

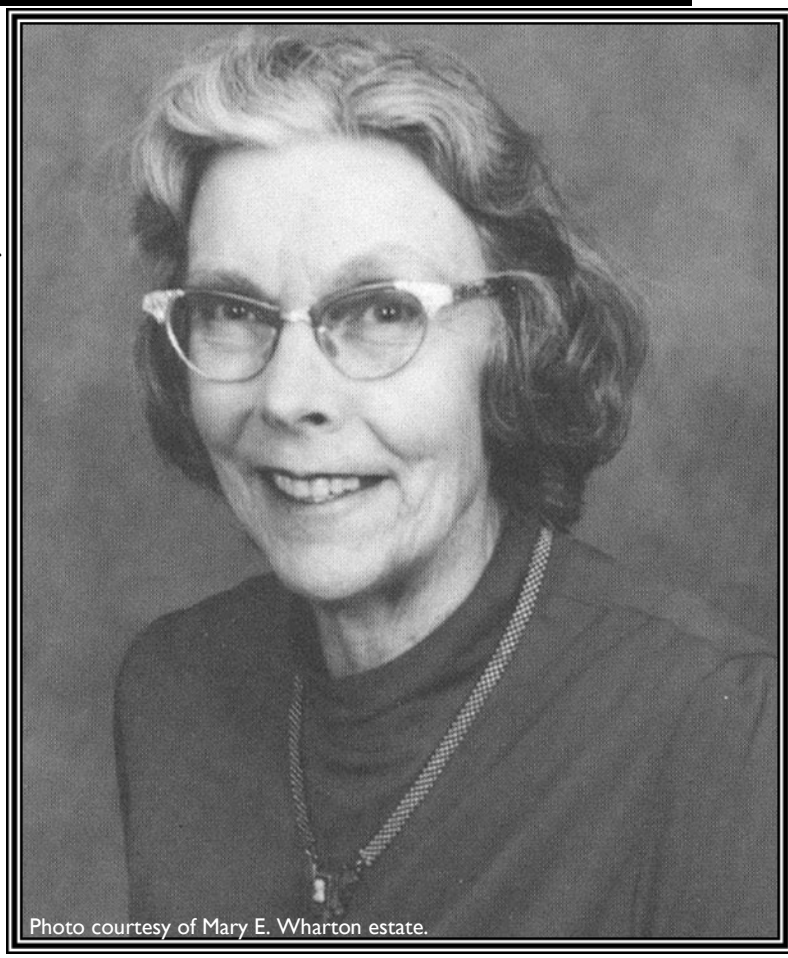


Photo courtesy of Mary E. Wharton estate.

Mary E. Wharton conducted one of the most classic botanical studies in Kentucky history—her Ph.D. dissertation on the Knobs region of Kentucky. In addition, her popular books introduced many students and members of the public to the more common plant species of Kentucky and these books remain popular today. She was also a strong advocate for conservation of natural lands, practicing what she preached. Her legacy lives on in her publications and in the Floracliff Nature Sanctuary.

Mary Wharton grew up in Lexington, Kentucky, and attended the University of Kentucky, graduating with degrees in botany and geology. She completed her Ph.D. at the University of Michigan in 1945, and her dissertation topic was the flora and vegetation of the Devonian-Missisippian black shale regions of Kentucky. This study of the Knobs region, the most comprehensive region-wide study yet attempted in Kentucky, resulted in the documentation of over 1000 taxa in the area. One of Wharton's collections of a dewberry species was named in her honor, *Rubus whartoniae*. A complete set of her specimens from the Knobs study were donated to the growing collection at the University of Kentucky, but unfortunately, these were lost when the UK Herbarium was completely destroyed by fire in 1948 (but many duplicates remained at other herbaria). Wharton accepted a teaching positon at Georgetown College in Georgetown, Kentucky, and was associated with Georgetown College for the remainder of her professional career. During her long career, she, in collaboration with Roger Barbour, produced a series of popular books dealing with the Kentucky flora, including books on wildflowers and ferns in 1971 and trees and shrubs in 1973. Her final book, also written with Roger Barbour, was *Bluegrass Land & Life*, published just prior to her death in 1991. This latter work represented the culmination of her outstanding career; it included a list of 1149 plant species of the flora of the Inner Bluegrass, and was her final plea for protection of the disappearing natural resources of the Bluegrass.

For 30 years the books authored by Wharton and Barbour were the only illustrated reference books for identifying the genera and species of Kentucky plants, and they remain popular to this day. Wharton was also an environmental activist throughout her life, and was involved in the fight to protect the Red River Gorge in the 1970s. She also established a 287 acre preserve on the Kentucky River in Fayette County, and named it Floracliff. The Floracliff Nature Sanctuary has now been dedicated as a Kentucky State Nature Preserve, and it provides workshops and many kinds of educational and research opportunities for Kentucky citizens. There is no doubt that the legacy of Mary E. Wharton to Kentucky botany has been substantial and long-lasting.

Best of American Forests

The Trees That Miss The Mammoths

Trees that once depended on animals like the wooly mammoth for survival have managed to adapt and survive in the modern world.

By Whit Bronaugh

When it still roamed the earth, the Columbian mammoth acted as a dispersal system for many tree species that still exist today. (Credit: Wolfmansf)

Warning: Reading this article may cause a whiplash-inducing paradigm shift. You will no longer view wild areas the same way. Your concepts of "pristine wilderness" and "the balance of nature" will be forever compromised. You may even start to see ghosts.

Consider the fruit of the Osage-orange, named after the Osage Indians associated with its range. In the fall, Osage-orange trees hang heavy with bright green, bumpy spheres the size of softballs, full of seeds and an unpalatable milky latex. They soon fall to the ground, where they rot, unused, unless a child decides to test their ballistic properties.

Trees that make such fleshy fruits do so to entice animals to eat them, along with the seeds they contain. The seeds pass through the animal and are deposited, with natural fertilizer, away from the shade and roots of the parent tree where they are more likely to germinate. But no native animal eats Osage-orange fruits. So, what are they for? The same question could be asked of the large seed pods of the honeylocust and the Kentucky coffeetree.

To answer these questions and solve the "riddle of the rotting fruit," we first need to go to Costa Rica. That is where tropical ecologist Dan Janzen of the University of Pennsylvania noticed that the fruits of a mid-sized tree in the pea family called *Cassia grandis* were generally scorned by the native animals, but gobbled up by introduced horses and cattle. Janzen, who received the Crafoord Prize (ecology's version of the Nobel) for his work on the co-evolution of plants and animals, had the idea that the seeds of *Cassia grandis*, and about 40 other large-fruited Costa Rican trees, were adapted to be dispersed by large mammals that are now extinct. He teamed up with Paul Martin, a paleoecologist at the University of Arizona, to develop the concept of ecological anachronisms.

An anachronism is something that is chronologically out of place: a typewriter or floppy disc in a modern office. Leather helmets at the Super Bowl. Or, hopefully, the internal combustion engine in the near future. An ecological anachronism is an adaptation that is chronologically out of place, making its purpose more or less obsolete. A tree with big fruits to attract huge mammals as dispersers of its seeds is anachronistic in a world of relatively small mammals.

By eating their long seed pods, giant ground sloths were the primary dispersal system for Cassia grandis. (Credit: Dxlinh)

In the case of *Cassia grandis*, Janzen and Martin figured that the foot-long woody seed pods were eaten for their sweet pulp by giant ground sloths and elephant-like gomphotheres. These multi-ton animals had such big gullets that they didn't need to chew a lot, so most of the seeds passed through the animals unharmed and ready to propagate more *Cassia grandis* trees. However, the gomphotheres and giant groundsloths disappeared about 13,000 years ago, toward the end of the last Ice Age of the Pleistocene.

Gomphotheres and ground-sloths? The Ice Age? What, you may be wondering, do they have to do with Osage-oranges, honeylocusts, and coffeetrees today?

In terms of evolutionary time, the difference between 13,000 years ago and now is like the difference between Friday, December 31, 1999 and Saturday, January 1, 2000. We may assign those two days to different centuries or millennia, but they are still part of

the same week. Likewise, all the animals and plants of 13,000 years ago belong just as much in the present. In fact, they still live in the present, with just one major exception: most of the big and fierce animals are now gone. This happened just a couple thousand years before we invented agriculture and planted the seeds of civilization. Woolly mammoths actually survived on some Arctic islands until after the Egyptian pyramids were built!

The giant ground sloth from London's Natural History Museum was once a dominant species in North America. (Credit: Ballista)

Today, if you searched all of North America north of Mexico, you would find only 17 species of land mammals that could be called megafauna, a term for animals that exceed 100 pounds. If you exclude the rare predators and arctic animals, you are left with just 10 species: pronghorn, mountain goat, bighorn sheep, bison, elk, moose, mule deer, white-tailed deer, black bear, and grizzly bear.

If not for the end-Pleistocene extinctions just 13,000 years ago, there would still be another 40 species of North American megafauna. They would include five species of deer or moose, two llamas, a camel, three horses, four ground-sloths ranging from 400 pounds to 3 tons, a 600-pound armadillo, a 2,000-pound turtle-like glyptodont, two ox-like species, a 5-ton mastodon, a 6-ton woolly mammoth, and a 9-ton Columbian mammoth. Did I mention the 400-pound beaver? Before you jump into your time machine for a true North American safari, be advised that there were also scimitar-cats, American lions, and sabertooths, each as big as or bigger than an African lion. There were three huge bears, including the 1,800-pound giant short-faced bear, the largest mammalian predator that ever walked the Earth.

Now let's return to the forlorn fruit of the Osage orange. Nothing today eats it. Once it drops from the tree, all of them on a given tree practically in unison, the only way it moves is to roll downhill or float in flood waters. Why would you evolve such an over-engineered, energetically expensive fruit if gravity and water are your only dispersers, and you like to grow on higher ground? You wouldn't. Unless you expected it to be eaten by mammoths or ground-sloths.

According to my field guide, Osage-orange has a limited natural range in the Red River region of east-central Texas, southeastern Oklahoma, and adjacent Arkansas. Indians used to travel hundreds of miles for the wood, prized as the finest for making bows. Then European settlers planted it widely as living fences, taking advantage of the tree's ability to spread via shoots from lateral roots. But Osage-orange persisted, and became widely naturalized long after the invention of barbed wire rendered them useless to farmers. The tree can now be found in 39 states and Ontario. If Osage-orange does so well elsewhere, why was it restricted to such a small area?

The answer likely lies in the disappearance of its primary disperser. Without mammoths, groundsloths, and other megafauna to transport its seeds uphill, the range of the species gradually shrank to the Red River region. In fact, fossils tell us that Osage-orange was much more widespread and diverse before the megafaunal extinctions. Back then, Osage-oranges could be found north up to Ontario, and there were seven, not just one, species in the Osage-orange genus, *Maclura*.

The Osage-orange tree once used this knobbly green ball to attract large mammals to disperse its seeds. (Credit: Mark Wells)

Another anachronistic tree is the Kentucky coffeetree, so named because early Kentucky settlers used its beans as a coffee substitute. Coffeetrees have tough, leathery pods with large, toxic seeds surrounded by a sweet pulp. Water cannot penetrate the thick seed coat to begin germination unless it is abraded or cut. Sounds like mammoth food to me. The natural range of coffeetrees is concentrated in the Midwest, but without its megafauna disperser, it is generally rare and mostly limited to floodplains.

Much the same can be said about the honeylocust, with its sweet seedpods up to 18 inches long. It is more common than coffeetrees, and is found in upland areas because cattle have filled in for the mastodons, camels, or some other dearly departed megamammal with a sweet tooth. The big-fruited pawpaws, persimmons, desert gourds, and wild squash may also have been dispersed more efficiently by recently extinct mammals.

Now when you see an Osage-orange, coffeetree, or honeylocust, you might sense the ghosts of megafauna munching on treats made just for them. (You may even see tropical ghosts in your local grocery store hungrily eyeing the avocados and papayas.) But you can also conjure megafaunal ghosts by considering the weapons designed by trees to discourage or slow their big mouths from eating the foliage.

Osage-orange, mesquite, and hawthorn all bear stiff thorns, spaced too widely apart to do much good against narrow deer muzzles, but they would be unavoidably

Defenses like that of the seed pods from the honeylocust and osage-orange trees are all adapted to the strength and size of megafauna. (Credit: Mark Wells)

painful in the wide mouths of groundsloths and mastodons. Wild honeylocusts have vicious, trident-like thorns several inches long covering the lower trunk and branches. Hollies have prickly leaves. Devil's walkingstick is festooned with wicked prickles. In all these heavily armored trees the thorns or prickles are present well above the reach of browsing deer, where they could still frustrate a mammoth's trunk or a giant ground-sloth's muzzle, but no higher. Cacti, Joshua trees, and other yuccas of the Southwest are particularly well armed in case the Shasta ground-sloths return.

If some trees have evolved big fruits so that huge mammals would disperse their seeds, why, now that those dispersers are gone, do they waste their efforts on big fruits that rot on the ground with seeds that will never germinate? If some trees have been in an evolutionary arms race with megafaunal browsers, why not disarm and save energy now that their enemies have been eliminated?

It's true that such adaptations are now anachronistic; they have lost their relevance. But the trees have been slow to catch on; a natural consequence of the pace of evolution. For a tree that lives, say, 250 years, 13,000 years represents only 52 generations. In an evolutionary sense, the trees don't yet realize that the megafauna are gone.

This would all be just another interesting natural history story if not for the very strong likelihood – many scientists would say fact – that humans, not climate change, caused the extinction of the megafauna, mainly by hunting. Humans first came to North America from Siberia just before the megafauna became extinct. That was also at the end of the last Ice Age, but all those species had been through over 20 previous ice-age cycles and come out just fine. The same two-step sequence occurred when humans first came to the West Indies about 6,000 years ago, Australia 50,000 years ago, Madagascar 2,000 years ago, and New Zealand less than 1000 years ago. Wherever humans first colonized the world, megafauna soon disappeared, an extinction pattern that is not correlated with climate change or anything else.

Today, the evidence of human impact is all around us, but now we know that even the most pristine of wilderness areas have many missing pieces. We've learned to see the ghosts of the lost megafauna in the rotting fruit, poor dispersal, and useless thorns of Osage-orange, Kentucky coffeetree, honeylocust, and others. But what are we still missing?

The thorns of the honeylocust once protected the tree's foliage from the giant ground sloths and other megafauna. (Credit: Mark Wells)

Imagine the Columbian mammoth, larger than an African elephant and sporting curved tusks up to 16 feet long, eating 300 pounds of vegetation every day in your neck of the woods; assuming you live anywhere in the southern half of North America (if you're in the north, just picture the smaller woolly mammoth). Now picture thousands of mammoth herds scattered across the continent. How did they affect trees and forests through their browsing, grazing, tromping, dispersing, and nutrient cycling?

Now add the mastodons, a bit more than half the size of Columbian mammoths, but still weighing 5 tons. Throw in the 3-ton giant ground-sloth and its three smaller but still big relatives. Remember the horses, camels, llamas, shrub-oxen, stag-moose, woodland muskox, and others. Don't forget to think in terms of herds, and don't think of them in the Ice Age. Rather, see their ghosts in the present, along your favorite forest hiking trail or peering over a fence along the interstate. How different would our forests and other habitats now be? What aspects of forest ecology do we not understand because of their absence? Is the coffeetree really a floodplain tree? Is an Osage-orange growing wild east of the Mississippi a naturalized alien, or a reintroduced native?

The first Americans could not have known they were causing extinctions, and they could not have understood the implications. But we no longer have such an excuse. As Aldo Leopold has advised, "The first rule of intelligent tinkering is to save all the pieces." We have tinkered, lost some of the most important pieces, and tried to put many where they don't belong. That we will continue to tinker there is no doubt. Everything will depend on how intelligently we do it. And that will depend, in part, on our ability to see the ghosts that haunt our trees.

Whit Bronaugh writes from Eugene, Oregon. Look for his work on Big Trees in the Spring issue.

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The Kentucky Native Plant Society was founded in 1986 for everyone interested in the native plants, trees, and wildflowers of Kentucky. Plants are essential to both the well-being of our Commonwealth's natural ecosystems and our enjoyment of its unique environment. With members in Kentucky and neighboring states, the Kentucky Native Plant Society is a leader in promoting education about, appreciation for, and conservation of the native flora of our Commonwealth.